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COMPLETE SPECIFICATION.

Process for Improving, especially for Supplying Permanent Stiffening Effects to, Cellulose Textile Fabrics and Textile Fabrics when Treated by such Process.

We, TRIATEX AG., a Body Corporate organised under the laws of Switzerland, of 217, Heinrichstrasse, Zurich, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention concerns a process for improving, especially for supplying permanent stiffening effects to, cellulose textile fabrics and textile fabrics when treated by such process; more particularly the invention is concerned with a process by which soft textile fabrics consisting of or containing cellulose fibres, such as, for example, woven and non-woven fabrics may be stiffened in such a manner that they become resistant to washing and dry-cleaning and simultaneously are given a high resilience.

The earliest processes by which textile materials were given support, volume and stiffness were treatments with thickening agents, especially derived from starch, albumen, gums or extracts of mucilage-producing sea-weed or lichen. In these processes, the thickening agents in general were applied in aqueous medium, and after such application, the textile material was dried. The stiffening effects obtained by such sizings were of poor fastiness properties, that is of poor resistance to laundering and dry-cleaning.

An improvement of the fastness properties may be obtained by the application of the aforesaid thickening agents together with formaldehyde or nitrogenous formaldehyde derivatives and an acid catalyst. During drying or by a separate heat treatment the film formed by the sizing becomes insoluble in water, and, as a consequence, relatively more resistant to laundering and cleaning operations.

A characteristic feature of the above described processes resides in that the textiles are treated in the absence of water or in the presence of only minor amounts of water, at elevated temperatures and in the presence of acids or acid-supplying compounds. Such treatment at elevated temperatures in general has the disadvantages of producing undesirable embrittlement of the textiles treated and considerable decrease of the strength properties thereof.

It is an object of the present invention to provide a process for improving textile fabrics which overcomes or reduces the aforesaid disadvantages.

In accordance with the present invention there is provided a process for improving, especially for supplying permanent stiffening effects to, textile fabrics consisting of or containing cellulose fibres, which process comprises treating the textile fabric with at least one polymeric substance having at least one hydroxy and/or amino group per molecule, and a reactive saturated organic compound which in the presence of an acid or basic catalyst is capable of reacting with the said polymeric substance and with the cellulose fibres of said fabric, and with a liquid comprising water and/or an organic solvent and the acid or basic catalyst at a temperature below 100°C until reaction has

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taken place between the polymeric substance and the reactive compound and between the cellulose fibres and said reactive compound.

The disadvantages of the prior art as outlined above, especially caused by the heat-treatment of the treated fabric in the absence of, or in the presence of only minor amounts of, water, in the presence of an acid-catalyst and the embrittlement as well as the decrease of the strength properties of the fabric resulting therefrom are, according to the present invention, prevented, because the acid or base used as catalyst acts on the fibres at relatively low temperatures, whereby detrimental effects to the fibres are strictly limited. Furthermore, because the treatment is at temperatures below 100°C, the polymeric substance and the fabric may be maintained in a condition of swelling exactly controllable by the composition of a treatment bath, whereby transformation of the film produced on the fibres into the insoluble state is promoted and increased permanency of this film is obtained, and undesirable embrittlement of the fibrous substrate and the polymeric substance is prevented.

Suitable polymeric substances having at least one hydroxy and/or amino group per molecule are, for example:

- high molecular weight carbohydrates and their derivatives, especially starch and starch derivatives;
- polymers of vinyl alcohol, as well as derivatives thereof, in which the hydroxy groups are partially substituted;
- proteins;
- polyamides and polyurethanes.

In carrying out the process of the invention, the polymeric substance becomes water-resistant as well as solvent-resistant by reaction with the compound capable of reacting in presence of an acid or basic catalyst with said polymeric substance as well as with the fibre material. Suitable reactive compounds which can be used in combination with strong mineral acids as catalyst are, for example, N-methylol compounds and aldehydes containing 1 to 10 carbon atoms. With basic catalysts, for example the following reactive compounds may be used:

- compounds containing at least two oxiran rings;
- compounds containing at least two halohydrin groups per molecule;
- epichlorohydrin;
- dihalopropanols;

The process of the present invention may for example be performed by at first applying the polymeric substance together with the reactive compound, if desired together with additives such as softeners and wetting agents, to the textile fabric, and subsequently, directly or if desired after an intermediate drying stage, applying the liquid mixture containing the catalyst. According to a further example at first only the polymeric substance is applied, whereafter, if desired after intermediate drying, treatment with the liquid mixture containing the catalyst and the reactive compound as well as, if desired, further additives, is effected.

The catalyst and the reactive compound may be used in the form of aqueous solutions. However, in order to decrease swelling of the fibrous substrate and/or the polymeric substance it may be advantageous to use mixtures of organic solvents, preferably water-miscible solvents, and water as carriers for the catalyst and the reactive compound. For example suitable mixture may be made up from an organic solvent and not more than 40% by weight of water.

The polymeric substance is rendered water-resistant and solvent-resistant by maintaining the fabric treated as above, for some time at a temperature below 100°C, preferably at a temperature between 10 and 30°C.

The invention is illustrated by the following examples:

Example 1:

Cotton fabric of basket weave, intended for use as stiffening interlining for clothes fabric and having a weight of 320 grams/m², is desized, soaked and bleached.

Then the fabric is treated on a three-roll padding machine with an aqueous mixture containing 150 grams/l of a polymeric substance containing commercial hydrolyzed starch and 300 grams/l of a reactive saturated compound comprising a 50% (w/v) solution of dimethylol-dihydroxyethylene urea. The degree of squeezing is adjusted to 68%. The fabric is dried on a tentering frame at 100°C to obtain a residual humidity of 3.5%. Then it is uniformly sprayed with a solution containing 950 pts by weight of formic acid (85% by weight) and 50 pts by weight of sulphuric acid (98% by weight) in an amount to deposit 80 grams of solution per square meter. The fabric is rolled up, left for 24 hours at room temperature and then is rinsed carefully with hot and cold water. The fabric after drying is of high stiffness which remains nearly unchanged even after repeated laundering at boiling temperature. The dimension stability is excellent.

Example 2:

A fabric of basket weave, intended for use as a soft interlining, the fibres of which

(warp and weft) are made up of polyester fibres (2/3) and cotton fibres (1/3), and having a weight of 200 grams/m², is desized, scoured, bleached and heat-fixed. Using the procedure of Example 1, a liquid mixture containing 60 grams/l of a highly viscous polyvinyl alcohol and 40 grams/l of a partially etherified starch is applied. The fabric then is impregnated with an aqueous solution containing 250 pts by weight of a 40% (w/v) solution of formaldehyde and 200 pts by vol. of 30% (by weight) hydrochloric acid on a padding machine; then it is squeezed (squeezing effect 60%). The fabric is rolled up, left in this condition for 18 hours at room temperature, washed carefully and neutralized with soda or ammonia. The finished fabric shows a stiffness which is outstandingly resistant to laundering.

Example 3:

A non-woven fabric as used for interlinings, consisting of 50% by weight of polyamide staple fibres and 50% by weight of regenerated cellulose staple fibres and having a weight of 95 grams/m² is padded with an aqueous solution containing 50 grams/l of gelatine. Then follows padding with a 50% sodium hydroxide solution in 40% (by volume) aqueous ethanol with a pick-up of solution of 60% (by weight), whereafter by use of a finely engraved roller epichlorohydrin is applied on one side of the fabric. The speed of the roller is adjusted with respect to the speed of the fabric so that a pick-up of 30% by weight of epichlorohydrin results. The fabric is then rolled up, wrapped in a polyethylene foil and held for 8 hours at room temperature. Then it is rinsed carefully and neutralized by means of acetic acid. A permanently stiff interlining material is obtained which is completely dimensionally stable.

WHAT WE CLAIM IS:—

1. A process for improving, especially for supplying permanent stiffening effects to, textile fabrics consisting of or containing cellulose fibres, which process comprises treating the textile fabric with at least one polymeric substance having at least one hydroxy and/or amino group per molecule, and a reactive saturated organic compound which in the presence of an acid or basic catalyst is capable of reacting with the said polymeric substance and with the cellulose fibres of said fabric, and with a liquid comprising water and/or an organic solvent and the acid or basic catalyst at a temperature below 100°C. until reaction has taken place between the polymeric substance and the reactive compound and between the cellulose fibres and said reactive compound.

2. A process according to claim 1, wherein the polymeric substance is a carbohydrate or derivative thereof.

3. A process according to claim 2, wherein the polymeric substance is starch or a derivative thereof.

4. A process according to claim 1, wherein the polymeric substance is a polyvinyl alcohol.

5. A process according to claim 4, wherein the hydroxy groups of said polyvinyl alcohol are partially substituted.

6. A process according to claim 1, wherein the polymeric substance is a protein.

7. A process according to claim 1, wherein the polymeric substance is a polyamide.

8. A process according to claim 1, wherein the polymeric substance is a polyurethane.

9. A process as claimed in any one of claims 1 to 8, wherein the reactive compound is a N-methylol compound and the catalyst is a strong mineral acid.

10. A process as claimed in any one of claims 1 to 8, wherein the reactive compound is an aldehyde containing 1 to 10 carbon atoms and the catalyst is a strong mineral acid.

11. A process as claimed in any one of claims 1 to 8, wherein the reactive compound is a compound having at least two oxiran rings and the catalyst is a base.

12. A process as claimed in any one of claims 1 to 8, wherein the reactive compound having at least two halohydrin groups and the catalyst is a base.

13. A process as claimed in any one of claims 1 to 8, wherein the reactive comfound in epichlorohydrin and the catalyst is a base.

14. A process as claimed in any one of claims 1 to 8, wherein the reactive compound is a dihalopropanol and the catalyst is a base.

15. A process according to any one of the preceding claims, wherein the polymeric substance and the reactive compound are applied together to the textile fabric, whereafter the fabric is treated with the liquid comprising the catalyst.

16. A process according to claim 15, wherein the fabric is subjected to intermediate drying before being treated with the said liquid.

17. A process according to any one of claims 1 to 14, wherein the polymeric substance is applied to the textile fabric, whereafter the fabric is treated with the liquid comprising the catalyst and the reactive compound.

18. A process according to claim 17, wherein the fabric is subjected to intermediate drying before being treated with the said liquid and the reactive compound.

19. A process according to any one of the preceding claims, wherein the liquid comprising the catalyst and if desired the reactive compound is water.

20. A process according to any one of claims 1 to 18, wherein the liquid containing the catalyst and if desired the reactive compound is a mixture containing an organic solvent and not more than 40% by weight of water.

21. A process according to any of the preceding claims, wherein the liquid contains water-miscible organic solvents.

22. A process according to any of the preceding claims, wherein the treatment takes place at temperatures of from 10 to 30°C.

23. A process according to claim 1 for improving textile fabrics, consisting of or containing cellulose fibres, substantially as hereinbefore described with reference to Example 1.

24. A process according to claim 1 for improving textile fabrics, consisting of or containing cellulose fibres, substantially as hereinbefore described with reference to Example 2.

25. A process according to claim 1 for improving textile fabrics, consisting of or containing cellulose fibres, substantially as hereinbefore described with reference to Example 3.

26. Textile fabrics consisting of or containing cellulose fibres, when treated by a process according to any one of the preceding claims.

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